

SECTION 283100 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. This Section specifies the fire-alarm system for buildings and structures.
2. Provide all labor, materials, and equipment as necessary to complete all work as indicated on the drawings, and as specified herein for a complete operating system.
3. Provide a minimum of 16 hours of factory service engineer training on the operation of the manufacturer's fire-alarm system in general and on the system installed on this project.

1.3 DEFINITIONS

- A. FACP: Fire Alarm Control Panel
- B. FARCP: Fire Alarm Remote Control Panel
- C. NACP: Fire Alarm Notification Appliance Control Panel
- D. FAA: Fire Alarm Annunciator Panel
- E. FAIGD: Fire Alarm Interactive Graphic Display Panel
- F. FFCP: Fire Fighter Control Panel
- G. LED: Light-emitting diode
- H. NICET: National Institute for Certification in Engineering Technologies
- I. Definitions in NFPA 72 apply to fire-alarm terms used in this Section

1.4 SYSTEM DESCRIPTION AND PERFORMANCE REQUIREMENTS

If the lighting panel serving the fire-alarm control panel is in a different room, install a fire-alarm disconnect switch next to the fire-alarm control panel. In general fire-alarm control panels and graphic annunciators for new buildings shall be located in the main lobby or where the fire trucks will most likely respond; verify with Department of Police and Public Safety. Depending on application, (classification of building), select paragraph A.1 for academic, business, or non-dormitory facilities, or paragraph A.2 for

dormitory facilities. Thermal detectors should be used in main electrical and mechanical rooms in lieu of smoke detectors (item to be reviewed with MSU staff).

- A. Fire-alarm system shall be a multiplexed point addressable type, non-coded, 24VDC, electrically supervised, U.L. approved, dedicated to fire-alarm service only.
 - 1. Alarm circuits shall be Class B, Style 4 for signaling line circuits and Class B, Style Y for notification appliance circuits for all academic or business occupancies. Speakers and strobes shall be operable over a single ground. The system shall comply with NFPA 72.
 - 2. Alarm circuits shall be 4-wire Class A, Type Z looped back to the control panel for all dormitories. Speakers and strobes shall be operable over a single open or ground. The system shall comply with NFPA 72.
- B. Device locations and ratings indicated on Drawings are minimum requirements, established for general scope and coordination purposes. In addition to devices shown on drawings, provide additional and supplemental devices as required to meet the requirements of the authorities having jurisdiction (AHJ), the fire alarm manufacturer, and all applicable codes up until bids are due. Any deviations including material and labor shall be included in the final bid price.
- C. Fire-alarm vendor shall provide sound pressure level calculations demonstrating compliance with NFPA 72 and establish quantities and tap settings of audible devices. Contractor shall modify settings as required to achieve proper levels for field conditions.
 - 1. If sound level is not acceptable to Owner, the Contractor shall adjust tap settings or add additional devices as required to achieve proper levels for field conditions.
- D. A complete functional system meeting the requirements of this specification, applicable codes and AHJ requirements shall be provided.
- E. Fire-alarm evacuation signal initiation shall be by one or more of the following devices:
 - 1. Manual stations
 - 2. Smoke detectors
 - 3. Heat detectors
 - 4. Automatic sprinkler system water flow
 - 5. Fire extinguishing system operation
 - 6. Fire standpipe system

If there is more than one area smoke detector in a space they may be cross-zoned, verify sequence of operation with Department of Police and Public Safety and indicate on the drawings.

- F. Fire-alarm evacuation signal shall initiate the following actions:
 - 1. Alarm notification appliances shall operate continuously.
 - 2. Identify alarm at the FACP, FAGA and FAA.
 - 3. Illuminate the respective LEDs on any modular bullet annunciators.
 - 4. Transmit an alarm signal to the remote alarm receiving station via contact closures.
 - 5. Release fire and smoke doors held open by magnetic door holders.

6. Activate voice/alarm communication system.
 7. Switch heating, ventilating and air-conditioning equipment controls to fire-alarm mode.
 8. Close smoke dampers in air ducts of system serving zone where alarm was initiated.
 9. Record events in the system memory.
 10. Record events by the system printer.
- G. Supervisory signal initiation shall be by one or more of the following devices or actions and will operate the trouble signal:
1. Operation of a fire-protection system or standpipe water flow switch.
 2. Low-air-pressure switch operation on a dry-pipe or pre-action sprinkler system.
 3. Operation of a valve tamper switch.
 4. Fire-pump power failure, including a dead-phase or phase-reversal condition.
 5. Fire-pump running.
- H. System trouble signal initiation shall be by one or more of the following devices or actions:
1. Open circuits, shorts and grounds of wiring for initiating device, signaling line, and notification-appliance circuits.
 2. Opening, tampering, or removal of alarm-initiating and supervisory signal-initiating devices.
 3. Loss of primary power at the FACP.
 4. Ground or a single break in FACP internal circuits.
 5. Abnormal ac voltage at the FACP.
 6. A break in standby battery circuitry.
 7. Failure of battery charging.
 8. Abnormal position of any switch at the FACP, FAGA or FAA.
 9. Dirty smoke or heat detector.
- I. Provide connection to and capability of transmitting separate signals to the remote supervising station (MSU Department of Police and Public Safety) via contact closure through security panel for the following:
1. Evacuation plan
 2. System trouble
 3. Sprinkler and/or standpipe water flow indication
 4. Sprinkler and/or standpipe water flow supervisory
 5. Duct smoke detectors
 6. Area smoke detectors (for spaces and smoke dampers)
 7. First smoke for smoke detectors cross zoned
- J. Transmit the following signals to the Central Campus DDC Siemens Apogee Energy Management System front end located in the IPF Building and port the 24 hour message through the Siemens Fire-alarm Supervising Station PC located in the Department of Police and Public Safety:
1. Evacuation alarm
 2. System trouble
 3. Sprinkler and/or standpipe water flow indication

4. Sprinkler and/or standpipe water flow supervisory
 5. Duct Smoke detectors
 6. Area smoke detectors (for spaces and smoke dampers)
 7. First smoke for smoke detectors cross zoned
- K. The fire alarm system shall seamlessly integrate with the existing National Time and Signal On-Point™ Central monitoring system providing the capability of remote notification to emergency responders and critical MSU staff members providing text and/or email messaging of the alarm location details.
1. Upon receipt of an alarm text or email message the emergency responder and/or MSU staff member shall be capable of remote access to On-Point™ Central for detailed building map viewing of the alarm point location identical to the map, which is displayed on the building's FAIGD.
 2. A minimum of one remote access user account shall be available to the responding fire department dispatch center for advanced building map viewing of the alarm event.
 3. The On-Point™ Central user interface shall store system events in one of four event queues represented by alarm, supervisory, trouble, or monitor.
- L. System Trouble and Supervisory Signal Actions: Sound trouble signal and annunciate at the FACP, FFCP, FAIGD, and FAA.
- M. There will be a "Trouble" silence switch located in the fire-alarm control panel and local annunciator that when operated will silence the audible "Trouble" devices while leaving the visual "Trouble" devices illuminated until the "Trouble" is corrected.
- N. Sprinkler water flow shall sound general evacuation alarm and will be annunciated in the fire-alarm annunciator panel and activate the audible trouble devices.
- O. The Fire Alarm System Control Panel shall be capable of system device disabling providing:
1. Individual and/or group disabling including but not limited to area smoke detectors, duct smoke detectors, fire pump, water-flow, pull stations, tamper switches, strobes, speakers, and door holders (held open).
 2. A minimum of six front panel programmable disable switches with an associated LED indicating the state of the programmed disable function.
 3. The front panel programmable disable switches shall be:
 - a. Accompanied with an associated LED indicating the state of the switch.
 - b. Located behind a locked Fire Alarm System Control Panel providing clear visibility and direct access. Embedded software switches using a menu driven user interface does not meet the requirement of this specification.
 - c. Duplicated on the FAIGD in the Control Panel screen.
 - d. Programmed to provide a system trouble on activation of the switch.
 - e. Programmed disabled options approved by Owner.
- P. Smoke/Heat Detectors:

1. Initiation of one smoke or heat detector shall sound the general evacuation alarm and send a signal to FACP, FARCP, FAIGD, FAA, the building DDC, and the Campus Security System.
 2. When area smoke detectors are cross zoned, initiation of one smoke detector in each zone shall be required to sound the general evacuation alarm and send a signal to FACP, FAIGD, FAA, the building DDC, and the Campus Security System.
 - a. Initiation of one smoke detector shall send a first smoke supervisory signal to the FACP, FARCP, FAIGD, FAA, Building DDC, Campus Security System, and sound local sounder base in room.
 3. In academic buildings, automatic magnetic door holders will release when any smoke detector adjacent to door(s) is activated. In dormitories, all automatic magnetic door holders shall release on any general evacuation alarm.
- Q. FARCP's and NACP's shall be applied and located as approved by the Owner and Engineer. Signaling and notification circuits originating from these panels shall only serve devices on the same floor that the panel resides. Exceptions to this shall only be by approval of the Owner.
- R. The use of an un-intelligent breakout enclosures housing circuits originating from other floors in lieu of an intelligent fire alarm control panel does not meet the requirement of this specification. Exceptions to this shall only be by approval of the Owner.

1.5 SUBMITTALS

- A. General Submittal Requirements:
1. Refer to Division 01 – Specification Sections.
 2. Shop Drawings shall be prepared by persons with the following qualifications:
 - a. Trained and certified by manufacturer in fire-alarm system design.
 - b. NICET-certified fire-alarm technician, Level III minimum.
 - c. Licensed or certified by authorities having jurisdiction.
- B. Product Data: For each type of product indicated.
- C. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.
1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire-alarm Systems" Chapter in NFPA 72.
 2. Shop drawings shall include:
 - a. Fire-alarm system description
 - b. Fire-alarm control panel (FACP) including layout of all modules
 - c. Fire-alarm graphic annunciator panel (FAIGD)

- d. Fire-alarm remote control panel (FARCP)
 - e. Fire-alarm remote annunciator (FAA)
 - f. Fire-alarm initiation devices
 - g. Fire-alarm signal devices
 - h. Fire-alarm one-line diagram
 - i. Fire-alarm wiring details
 - j. Fire-alarm module drawings
3. System Operation Description: Detailed description for this Project, including method of operation and supervision of each type of circuit and sequence of operations for manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.
 4. Device Address List: Coordinate with final system programming. Allow for two corrections of device/system descriptions.
 5. System riser diagram with device addresses, conduit sizes, and cable and wire types and sizes.
 6. Include voltage drop calculations for notification appliance circuits.
 7. Wiring diagram:
 - a. Power, signal, and control wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Show the wiring color code.
 - b. On all addressable systems, all devices on a loop shall be documented in a sequential order that the trunk enters and leaves them.
 - c. On all non-addressed device loops, all devices shall have numbers assigned to each device which is directly related to their wiring sequence.
 - d. Show all break-out boxes.
 8. Batteries: Size calculations. Battery size shall be a minimum of 125% of the calculated requirement.
 9. Duct Smoke Detectors: Performance parameters and installation details for each detector, verifying that each detector is listed for the complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
 10. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.

11. Include documentation for smoke and heat detectors indicating compliance with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 12. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72.
 13. Voice/Alarm Signaling Service: Equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
 14. Floor Plans: Indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.
 15. Control Module: Provide calculations indicating circuit loading with 20% spare capacity.
- D. Qualification Data: For qualified Installer.
- E. Field quality-control reports.
- F. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
 2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
 3. Record copy of site-specific software.
 4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:
 - a. Frequency of testing of installed components.
 - b. Frequency of inspection of installed components.
 - c. Requirements and recommendations related to results of maintenance.
 - d. Manufacturer's user training manuals.
 5. Manufacturer's required maintenance related to system warranty requirements.
 6. Three complete sets of fire alarm system schematics, maintenance manuals of all system components and modules, and schematics of all modules and circuit boards. Include abbreviated operating instructions and 11" x 17" building drawings with device layout, junction boxes, and conduit runs for mounting in plastic folder inside FACP. Device addressing shall be included on the 11" x 17" building drawings for maintenance.
 7. Three copies of the device list and certificate of completion.
- G. Software and Firmware Operational Documentation:
1. Software operating and upgrade manuals.
 2. Program Software Backup: On magnetic media or compact disk, complete with data files.

3. Device address list.
4. Printout of software application and graphic screens.

H. As-Built Drawings

1. Contractor shall submit as-built drawings as specified in Division 1 - General Requirements.
2. The Contractor shall submit as-built drawings indicating the location of all devices, addresses, junction boxes, and conduit runs; including conduit size, circuiting and circuit numbers, and number of wires in each run; and the number and sequential wiring of speakers and strobes.. The drawings shall be separate from the electrical drawings. Provide “as-built” drawings in electronic media, CD, minimum AutoCAD 2004 format and Adobe Acrobat pdf format.

1.6 QUALITY ASSURANCE

A. Codes and Standards

1. Americans with Disabilities Act
2. National Electrical Code
3. National Fire Protection Agency
4. Underwriter’s Laboratory

B. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

C. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level II technician.

D. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

G. Guarantee

1. The Contractor shall provide a written guarantee stating that all work performed and material furnished is free from all defects in workmanship, and material for a period of two years after the equipment has been accepted by the Owner. Final payment or Certificate of Substantial Completion, whichever is issued first, shall constitute Owner acceptance.

2. A 24 hour telephone number or numbers shall be provided for quick service engineering assistance concerning hardware and software problems. There shall be provisions made for getting an expert on the scene quickly should the need arise, minimum 8 hour on site response time.

1.7 PROJECT CONDITIONS

- A. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:
 1. Notify Owner no fewer than two weeks in advance of proposed interruption of fire-alarm service.
 2. Do not proceed with interruption of fire-alarm service without the Owner's written permission.

1.8 SEQUENCING AND SCHEDULING

- A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service and label existing fire-alarm equipment "NOT IN SERVICE" until removed from the building.
- B. If any interruption of the existing or new fire alarm system is required the Contractor must provide a "fire watch" for that area of the building.
- C. Equipment Removal: After acceptance of new fire-alarm system, remove existing disconnected fire-alarm equipment and wiring.

1.9 SOFTWARE SERVICE AGREEMENT

- A. Comply with UL 864.
- B. Technical Support: Beginning with Substantial Completion, provide software support for two years.
- C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
 1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.10 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Deliver materials to the IPF Electronics Shop through the Project Representative.
1. Notification Appliances: Quantity equal to 10 percent of amount installed, but not less than 1 unit and not more than 5 of each type installed.
 2. Smoke, Thermal, and Fire Detectors: Quantity equal to 10 percent of amount of each type installed, but not less than 1 unit of each type and not more than 10 of each type installed.
 3. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but not less than 1 unit of each type and not more than 5.
 4. Duct Detectors: Minimum of 2 of each type installed.
 5. Keys and Tools: All extra sets for access to locked and tamper proofed components.
 6. Fuses: Two of each type installed in the system.
 7. Spare controller module and monitor module, one of each type to be kept on hand at MSU IPF electronic shop for maintenance.
 8. Manual Stations: Quantity of two for each type installed.
 9. NAC's and PAD's: Quantity of two for each type installed.

1.11 PROJECT CONDITIONS

- A. Interruption of Existing Fire Alarm Service: Do not interrupt fire alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:
1. Notify Owner no fewer than 10 days in advance of proposed interruption of fire alarm service.
 2. Do not proceed with interruption of fire alarm service without Owner's permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Fire Alarm Control Panel and Equipment:
 - a. National Time and Signal Corporation 900 Series
 - b. Or prior approved equal by Siemens Building Technologies, Inc. XLS Series.

2.2 FIRE ALARM CONTROL PANEL (FACP)

A. General Description:

1. Modular, power-limited design with electronic modules, UL 864 listed.
2. Addressable initiation devices that communicate device identity and status.
 - a. Smoke sensors shall additionally communicate sensitivity setting and allow for adjustment of sensitivity at the FACP.
 - b. Temperature sensors shall additionally test for and communicate the sensitivity range of the device.
3. Addressable control circuits for operation of mechanical equipment.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at the FACP and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu:

1. Annunciator and Display: Liquid-crystal type, six inch, 640 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands; and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.

C. FACP User Interface: System events shall be stored in one of four event queues represented by alarm, supervisory, trouble or monitor. The alarm event shall have priority over the supervisory, trouble, and monitor event queues with the ability to alternate between queues with a single button depression. On the activation of a system event the following sequence shall occur:

1. On Alarm: The FACP interface shall display the first alarm event with the ability to scroll to the subsequent alarm events via the Alarm Queue button. The FACP interface shall on alarm display the following:
 - a. The Alarm Queue Led flashes indicating an alarm status is present.
 - b. A custom message is displayed detailing location.
 - c. The display shall indicate the number of active alarms present on the system.
 - d. The Alarm event status shall be identified as an active or restored event.
 - e. The Floor alarm zone LED is illuminated red indicating which floor(s) are in alarm.
 - f. The Floor Output LED is illuminated green indicating which floor(s) are sounding.
 - g. Alarm event acknowledge sequence shall execute as follows:
 - 1) The Alarm Queue button will sequentially step the operator through the alarm events, acknowledging the event on each Alarm Queue button depression. On the completion of acknowledging all alarm events, the Alarm Queue Led illuminates steady.

- 2) A secondary means to view the alarm events shall be available via the up and down arrows. The Alarm Queue button shall return the display to the last acknowledged event.
 - 3) The FACP shall be capable of reset, alarm silence, and trouble silence by the Operator free of the need for 100 percent operator acknowledgement of prior events.
 2. On Supervisory: The FACP interface shall display the first supervisory event with the ability to scroll to the subsequent supervisory events via the Supervisory Queue button. The FACP interface shall on supervisory display the following:
 - a. The Supervisory Queue Led flashes indicating a Supervisory status is present.
 - b. A custom message is displayed detailing location.
 - c. The display shall indicate the number of active Supervisory(s) present on the system.
 - d. The Supervisory event status shall be identified as active or restored.
 - e. The Floor supervisory zone LED is illuminated amber indicating which floor(s) are in supervisory.
 - f. Supervisory event acknowledge sequence shall execute as follows:
 - 1) The Supervisory Queue button will sequentially step the operator through the supervisory events, acknowledging the event on each Supervisory Queue button depression. On the completion of acknowledging all supervisory events, the Supervisory Queue Led illuminates steady.
 - 2) A secondary means to view the supervisory events shall be available via the up and down arrows. The Supervisory Queue button shall return the display to the last acknowledged event.
 - 3) The FACP shall be capable of reset, alarm silence, and trouble silence by the Operator free of the need for 100 percent operator acknowledgement of prior events.
3. On Trouble: The FACP interface shall display the first Trouble event with the ability to scroll to the subsequent Trouble events via the Trouble Queue button. The FACP interface shall on Trouble display the following:
 - a. The Trouble Queue Led flashes indicating a Trouble status is present.
 - b. A custom message is displayed detailing location.
 - c. The display shall indicate the number of active Troubles present on the system.
 - d. The Trouble event status shall be identified as active or restored event.
 - e. The Floor alarm zone trouble LED flashes amber indicating which floor(s) are in trouble.
 - f. Trouble event acknowledge sequence shall execute as follows:
 - 1) The Trouble Queue button will sequentially step the operator through the trouble events, acknowledging the event on each Trouble Queue button depression. On the completion of acknowledging all trouble events, the Trouble Queue Led illuminates steady.

- 2) A secondary means to view the trouble events shall be available via the up and down arrows. The Trouble Queue button shall return the display to the last acknowledged event.
 - 3) The FACP shall be capable of reset, alarm silence, and trouble silence by the Operator free of the need for 100 percent operator acknowledgement of prior events.
4. On Monitor: The FACP interface shall display the first Monitor event with the ability to scroll to the subsequent Monitor events via the Monitor Queue button. The FACP interface shall on Monitor display the following:
- a. The Monitor Queue Led flashes indicating a monitor status is present.
 - b. A custom message is displayed detailing location.
 - c. The display shall indicate the number of active Monitors present on the system.
 - d. The Monitor event status shall be identified as active or restored event.
 - e. Monitor event acknowledge sequence shall execute as follows:
 - 1) The Monitor Queue button will sequentially step the operator through the monitor events, acknowledging the event on each Monitor Queue button depression. On the completion of acknowledging all monitor events, the Monitor Queue Led illuminates steady.
 - 2) A secondary means to view the monitor events shall be available via the up and down arrows. The Monitor Queue button shall return the display to the last acknowledged event.
 - 3) The FACP shall be capable of reset, alarm silence, and trouble silence by the Operator free of the need for 100 percent operator acknowledgement of prior events.

D. Circuits

Change the circuit paragraphs as necessary for a four wire system for residence halls application.

1. Signaling Line Circuits: NFPA 72, Class B, Style 4.
 - a. System Layout: Install no more than 50 percent capacity addressable devices on each signaling line circuit (not to exceed 60 devices per loop maximum).
2. Notification-Appliance Circuits: NFPA 72, Class B, Style Y.
 - a. Audible/Speaker Circuit: No more than 50 percent capacity.
 - b. Visual Circuit: No more than 50 percent capacity.
3. Actuation of alarm notification appliances, emergency voice communications, annunciation, smoke control, and actuation of suppression systems shall occur within 10 seconds after the activation of an initiating device.

4. Electrical monitoring for the integrity of wiring external to the FACP for mechanical equipment shutdown providing a break in the circuit will cause mechanical equipment to shut down.
- E. Notification-Appliance Circuit: Operation shall sound in a three pulse temporal pattern.
1. A pre-recorded digital voice message, complying with ANSI S3.41 shall be provided but not activated.
 2. Amplifier output voltage shall be 70 volts with speakers connected at 70 volts.
- F. Alarm Silencing, Trouble, and Supervisory Alarm Reset: Manual reset at the FACP after initiating devices are restored to normal.
1. Silencing-switch operation halts alarm operation of audible notification appliances and activates an "alarm silence" light. Display of identity of the alarm zone or device is retained. The visual notification appliances shall continue to operate.
 2. Subsequent alarm signals from other devices or zones reactivate notification appliances until silencing switch is operated again.
 3. When alarm-initiating devices return to normal and system reset switch is operated, notification appliances operate again until alarm silence switch is reset.
- G. Walk Test: A test mode to allow one person to test alarm and supervisory features of initiating devices. Enabling of this mode shall require the entry of a password. The FACP and annunciators shall display a test indication while the test is underway. If testing ceases while in walk-test mode, after a preset delay, the system shall automatically return to normal.
- H. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and control of changes in those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and make a print-out of the final adjusted values on the system printer.
- I. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, trouble and water flow through auxiliary contacts connected to the existing security system panel and through existing central control building energy management panel.
- J. Voice/Alarm Signaling Service: A central emergency communication system with microphone, preamplifier, amplifier, and tone generator located in the FACP.
1. System shall be capable of indicating number of alarm channels for automatic, simultaneous transmission of different announcements to different zones, or for manual transmission of announcements by use of the central-control microphone. Amplifiers shall be UL 1711 listed.

- a. Allow the application of and evacuation signal to indicated number of zones and, at the same time, allow voice paging to the other zones selectively or in any combination.
 - b. Programmable tone and message sequence selection.
 - c. Standard digitally recorded messages for "Evacuation" and "All Clear".
 - d. Generate tones to be sequenced with audio messages of the type recommended by NFPA 72 and that are compatible with tone patterns of the notification-appliance circuits of the FACP.
2. Status Annunciator: Indicate the status of various voice/alarm speaker zones.
- K. Portable Printer: Ports shall be RS-232 for system printer.
1. Provide printer interface card for unsupervised interface with printer.
 2. Provide printer in nearest mechanical or communication room closest to FACP. This printer is a provided on a project specific basis and is not required for all new installations.
- L. Printout of Events: On receipt of signal, when printer is installed, print alarm, supervisory, and trouble events. Identify zone, device, and function. Include type of signal (alarm, supervisory, or trouble), and date and time of occurrence. Differentiate alarm signals from all other printed indications. Also print system reset event, including the same information for device, location, date, and time. Commands initiate the printing of a list of existing alarm, supervisory, and trouble conditions in the system and a historical log of events.
- M. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signal, supervisory signal shall be powered by the 24-V dc source.
1. The alarm current draw of the entire fire alarm system shall not exceed 80 percent of the power-supply module rating.
- N. Secondary Power: Provide standby batteries with charger for operation of the system in the supervisory mode for up to 24 hours followed by a minimum of 5 minutes of an alarm condition in the event of power failure.
1. Batteries: Sealed lead calcium.
 2. Battery and Charger Capacity: Comply with NFPA 72.
- O. Surge Protection:
1. Install surge protection on normal ac power for the FACP and its accessories.
 2. Install surge protectors recommended by FACP manufacturer. Install on all system wiring external to the building housing the FACP.

- P. Provide Corbin catalog no. 15751 camlock and no. TEU-1 key.
- Q. Event History Log: Minimum 300 event history log of alarm, trouble and sprinkler supervisory alarm conditions and shall be complete with one-man system walk test.
- R. Provide FACP or remote panels sized to accommodate a minimum of two additional initiation, two speakers and four strobe circuits.
- S. Provide minimum of fourteen sets of normally open and normally closed auxiliary contacts (two for alarm, two for trouble, two for waterflow, two for first smoke, and six spare).

2.3 FIRE ALARM REMOTE CONTROL PANEL (FARCP)

A. General Description:

- 1. Modular, power-limited design with electronic modules, UL 864 listed.
- 2. Addressable initiation devices that communicate device identity and status to the main FACP.
- 3. Addressable control circuits for operation of mechanical equipment.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at the FACP and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

- 1. Annunciator and Display: Liquid-crystal type, two line, 40 characters, minimum.
- 2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

C. FARCP User Interface: System events shall be stored in one of four event queues represented by alarm, supervisory, trouble or monitor. The alarm event shall have priority over the supervisory, trouble, and monitor event queues with the ability to alternate between queues with a single button depression. On the activation of a system event the following sequence shall occur:

- 1. On Alarm: The FARCP interface shall display the first alarm event with the ability to scroll to the subsequent alarm events via the Alarm Queue button. The FACP interface shall on alarm display the following:
 - a. The Alarm Queue Led flashes indicating an alarm status is present.
 - b. A custom message is displayed detailing location.
 - c. The display shall indicate the number of active alarms present on the system.
 - d. The Alarm event status shall be identified as an active or restored event.
 - e. The Floor alarm zone LED is illuminated red indicating which floor(s) are in alarm.
 - f. The Floor Output LED is illuminated green indicating which floor(s) are sounding.

- g. Alarm event acknowledge sequence shall execute as follows:
 - 1) The Alarm Queue button will sequentially step the operator through the alarm events, acknowledging the event on each Alarm Queue button depression. On the completion of acknowledging all alarm events, the Alarm Queue Led illuminates steady.
 - 2) A secondary means to view the alarm events shall be available via the up and down arrows. The Alarm Queue button shall return the display to the last acknowledged event.
 - 3) The FARCP shall be capable of reset, alarm silence, and trouble silence by the Operator free of the need for 100 percent operator acknowledgement of prior events.
2. On Supervisory: The FARCP interface shall display the first supervisory event with the ability to scroll to the subsequent supervisory events via the Supervisory Queue button. The FARCP interface shall on supervisory display the following:
 - a. The Supervisory Queue Led flashes indicating a Supervisory status is present.
 - b. A custom message is displayed detailing location.
 - c. The display shall indicate the number of active Supervisory(s) present on the system.
 - d. The Supervisory event status shall be identified as active or restored.
 - e. The Floor supervisory zone LED is illuminated amber indicating which floor(s) are in supervisory.
 - f. Supervisory event acknowledge sequence shall execute as follows:
 - 1) The Supervisory Queue button will sequentially step the operator through the supervisory events, acknowledging the event on each Supervisory Queue button depression. On the completion of acknowledging all supervisory events, the Supervisory Queue Led illuminates steady.
 - 2) A secondary means to view the supervisory events shall be available via the up and down arrows. The Supervisory Queue button shall return the display to the last acknowledged event.
 - 3) The FARCP shall be capable of reset, alarm silence, and trouble silence by the Operator free of the need for 100 percent operator acknowledgement of prior events.
3. On Trouble: The FARCP interface shall display the first Trouble event with the ability to scroll to the subsequent Trouble events via the Trouble Queue button. The FACP interface shall on Trouble display the following:
 - a. The Trouble Queue Led flashes indicating a Trouble status is present.
 - b. A custom message is displayed detailing location.
 - c. The display shall indicate the number of active Troubles present on the system.
 - d. The Trouble event status shall be identified as active or restored event.
 - e. The Floor alarm zone trouble LED flashes amber indicating which floor(s) are in trouble.
 - f. Trouble event acknowledge sequence shall execute as follows:

- 1) The Trouble Queue button will sequentially step the operator through the trouble events, acknowledging the event on each Trouble Queue button depression. On the completion of acknowledging all trouble events, the Trouble Queue Led illuminates steady.
 - 2) A secondary means to view the trouble events shall be available via the up and down arrows. The Trouble Queue button shall return the display to the last acknowledged event.
 - 3) The FARCP shall be capable of reset, alarm silence, and trouble silence by the Operator free of the need for 100 percent operator acknowledgement of prior events.
4. On Monitor: The FARCP interface shall display the first Monitor event with the ability to scroll to the subsequent Monitor events via the Monitor Queue button. The FACP interface shall on Monitor display the following:
- a. The Monitor Queue Led flashes indicating a monitor status is present.
 - b. A custom message is displayed detailing location.
 - c. The display shall indicate the number of active Monitors present on the system.
 - d. The Monitor event status shall be identified as active or restored event.
 - e. Monitor event acknowledge sequence shall execute as follows:
 - 1) The Monitor Queue button will sequentially step the operator through the monitor events, acknowledging the event on each Monitor Queue button depression. On the completion of acknowledging all monitor events, the Monitor Queue Led illuminates steady.
 - 2) A secondary means to view the monitor events shall be available via the up and down arrows. The Monitor Queue button shall return the display to the last acknowledged event.
 - 3) The FACP shall be capable of reset, alarm silence, and trouble silence by the Operator free of the need for 100 percent operator acknowledgement of prior events.

D. Circuits:

Change the circuit paragraphs as necessary for a four wire system for residence halls application.

1. Signaling Line Circuits: NFPA 72, Class B, Style 4.
 - a. System Layout: Install no more than 50 percent capacity addressable devices on each signaling line circuit (not to exceed 60 devices per loop maximum).
2. Notification-Appliance Circuits: NFPA 72, Class B, Style Y.
 - a. Audible/Speaker Circuit: No more than 50 percent capacity.
 - b. Visual Circuit: No more than 50 percent capacity.

3. Actuation of alarm notification appliances, emergency voice communications, annunciation, smoke control, and actuation of suppression systems shall occur within 10 seconds after the activation of an initiating device.
 4. Electrical monitoring for the integrity of wiring external to the FARCP for mechanical equipment shutdown providing a break in the circuit will cause mechanical equipment to shut down.
- E. Notification-Appliance Circuit: Operation shall sound in a three pulse temporal pattern.
1. A pre-recorded digital voice message, complying with ANSI S3.41 shall be provided but not activated.
 2. Amplifier output voltage shall be 70 volts with speakers connected at 70 volts.
- F. Power Supply for Supervision Equipment: Supply for audible and visual equipment for supervision of the ac power shall be from a dedicated dc power supply, and power for the dc component shall be from the ac supply.
- G. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.
- H. Provide Corbin catalog no. 15751 camlock and no. TEU-1 key.
- 2.4 FIRE ALARM INTERACTIVE GRAPHIC DISPLAY (FAIGD)
- A. Manufacturers:
1. National Time and Signal Corporation, Model IGD-1042
- B. The FAIGD shall meet UL864.
- C. The fire alarm graphic annunciator shall be the National Time and Signal On-Point™ interactive graphical display enabled with the On-Point™ Fire Alarm Manager and Maintenance Manager.
- D. The Fire Alarm Manager shall store system events in one of four event queues represented by alarm, supervisory, trouble or monitor. The alarm event shall have priority over the supervisory, trouble, and monitor event queues with the ability to alternate between queues with a single button depression. On the activation of a system event the following sequence shall occur:
1. On Alarm: The FAIGD interface shall display:
 - a. The Graphical alarm screen providing on a single screen of view:

- 1) Alarming device as it relates to the building's elevation and floor location.
 - a) The alarming device on the floor shall illuminate red.
 - b) The alarming floor shall illuminate red
 - 2) The alarm building map shall color code the building rooms as follows:
 - a) Elevator and stairwells in a rose color
 - b) Residence rooms in a yellow color
 - c) Storage rooms in a brown color
 - d) Mechanical and electrical room in a lime color
 - e) Offices in a light blue color
 - f) Restrooms in a tan color
 - 3) The FAIGD shall display the Alarm Queue. The Alarm Queue event nomenclature shall identify:
 - a) Event type
 - b) Custom location message
 - c) Time and date of the alarm
 - d) Time and date of the restoral
 - 4) The alarm screen shall provide visible marking correlation between the selected alarming device icon located on the building map and the alarming device's queue event location.
 - 5) Display the Fire Pumps status indicating active or non-active state for phase reversal, power loss, and pump running.
 - 6) The alarm screen shall be capable of viewing the supervisory, trouble, and monitor screens with a single button depression with the capability of returning to the alarm screen on a single depression of the Alarm Queue button.
2. On Supervisory: The FAIGD interface shall display:
- a. The Graphical supervisory screen providing on a single screen of view:
 - 1) Active device as it relates to the building's elevation and floor location.
 - a) The active device on the floor shall illuminate amber.
 - b) The active floor shall illuminate amber
 - 2) The supervisory building map shall color code the building rooms as follows:
 - a) Elevator and stairwells in a rose color
 - b) Residence rooms in a yellow color
 - c) Storage rooms in a brown color
 - d) Mechanical and electrical room in a lime color
 - e) Offices in a light blue color
 - f) Restrooms in a tan color
 - 3) The FAIGD shall display the Supervisory Queue. The Supervisory Queue event nomenclature shall identify:
 - a) Event type
 - b) Custom location message
 - c) Time and date of the activation
 - d) Time and date of the restoral

- 4) The supervisory screen shall provide visible marking correlation between the selected active device icon located on the building map and the active device's queue event location.
 - 5) Display the Fire Pumps status indicating active or non-active state for phase reversal, power loss, and pump running.
 - 6) The supervisory screen shall be capable of viewing the alarm, trouble, and monitor screens with a single button depression with the capability of returning to the supervisory screen on a single depression of the Supervisory Queue button.
3. On Trouble: The FAIGD interface shall display:
- a. The Graphical trouble screen providing on a single screen of view:
 - 1) Active device as it relates to the building's elevation and floor location.
 - a) The active device on the floor shall illuminate amber.
 - b) The active floor shall illuminate amber
 - 2) The trouble building map shall color code the building rooms as follows:
 - a) Elevator and stairwells in a rose color
 - b) Residence rooms in a yellow color
 - c) Storage rooms in a brown color
 - d) Mechanical and electrical room in a lime color
 - e) Offices in a light blue color
 - f) Restrooms in a tan color
 - 3) The FAIGD shall display the Trouble Queue. The Trouble Queue event nomenclature shall identify:
 - a) Event type
 - b) Custom location message
 - c) Time and date of the activation
 - 4) The trouble screen shall provide visible marking correlation between the selected active device icon located on the building map and the active device's queue event location.
 - 5) Display the Fire Pumps status indicating active or non-active state for phase reversal, power loss, and pump running.
 - 6) The trouble screen shall be capable of viewing the alarm, supervisory, and monitor screens with a single button depression with the capability of returning to the trouble screen on a single depression of the Trouble Queue button.
4. On Monitor: The FAIGD interface shall display:
- a. The Graphical monitor screen providing on a single screen of view:
 - 1) Active device as it relates to the building's elevation and floor location.
 - a) The active device on the floor shall illuminate green.
 - b) The active floor shall illuminate green
 - 2) The monitor building map shall color code the building rooms as follows:
 - a) Elevator and stairwells in a rose color
 - b) Residence rooms in a yellow color

- c) Storage rooms in a brown color
 - d) Mechanical and electrical room in a lime color
 - e) Offices in a light blue color
 - f) Restrooms in a tan color
- 3) The FAIGD shall display the Monitor Queue. The Monitor Queue event nomenclature shall identify:
 - a) Event type
 - b) Custom location message
 - c) Time and date of the activation
 - 4) The monitor screen shall provide visible marking correlation between the selected active device icon located on the building map and the active device's queue event location.
 - 5) Display the Fire Pumps status indicating active or non-active state for phase reversal, power loss, and pump running.
 - 6) The monitor screen shall be capable of viewing the alarm, supervisory, and trouble screens with a single button depression with the capability of returning to the monitor screen on a single depression of the Monitor Queue button.
- E. The Fire Alarm Manager software shall:
1. Annunciate 100 percent of all all initiating device points including but not limited to smoke detectors, heat detectors, pull stations, duct detectors, water flow, supervisory devices, fire pump status, etc.
 2. Identify hazardous material storage locations.
 3. Emergency equipment locator for but not limited to Fire Alarm Control Panel, fire extinguishers, fire hoses, shut off valves, fire elevators, stairwells, etc.
- F. The FAIGD shall use the building floor plans. Room names for rooms containing hazardous materials or that are secure shall only be visible during a fire alarm event or when in the maintenance mode.
- G. In the non-emergency mode the FAIGD shall display the following:
1. Alarm Queue
 2. Supervisory Queue
 3. Trouble Queue
 4. Monitor Queue
 5. Fire Pump status including pump running, phase reversal, and power loss.
- H. The FAIGD's Maintenance Manager Software provides an interactive touch-screen user display to make available facility fire alarm design installation information, active status conditions, and maintenance and service support functions. It shall provide:
1. Enable and Disable capability for input and output devices meeting UL864.
 2. Six custom programmable system device disabling switches capable of:

- a. Individual and/or group disabling including but not limited to area smoke detectors, duct smoke detectors, fire pump, water-flow, pull stations, tamper switches, strobes, speakers, and door holders (held open).
 - b. Custom programmable disable switches shall have an associated indicator indicating the state of the programmed disable function.
 - c. The six custom programmable disable switches shall be replicated on the FACP.
 - d. Programmed disabled options approved by Owner.
3. Standard system output device disabling switches capable of:
- a. Device type disable switches per floor or zone for:
 - 1) All floor/zone sounder bases
 - 2) All floor/zone Speakers
 - 3) All floor strobes
 - 4) All floor/zone door holders
 - 5) All floor/zone Damper and AHU control
 - b. Disable switches shall have an associated indicator indicating the state of the programmed disable function.
4. Standard system input device disabling switches capable of:
- a. Device type disable switches per floor or zone for:
 - 1) All floor/zone smoke detectors
 - 2) All floor/zone dorm room smoke detectors
 - 3) All floor/zone heat detectors
 - 4) All floor/zone duct detectors
 - 5) All floor/zone pull stations
 - 6) All floor/zone water flow
 - 7) All floor/zone tamper switches
 - b. Disable switches shall have an associated indicator indicating the state of the programmed disable function.
5. The capability of device status query checking for trouble, alarm, and dirty detector, prior to re-enabling.
6. Fire Alarm system as-built wire drawings shall be capable of illuminating active alarm, supervisory, trouble, and monitor device points.
7. Fire Alarm riser diagram installation details capable of illuminating active alarm, supervisory, trouble, and monitor device points.
8. Illumination of the active device points include but not limited to smoke detectors, heat detectors, pull stations, duct detectors, water flow devices, supervisory devices, fire pump status, control modules, NACP, etc..
9. System events shall be stored in one of four event queues represented by alarm, supervisory, trouble or monitor. The alarm event shall have priority over the supervisory, trouble, and monitor event queues with the ability to alternate between queues with a single button depression.
- I. The FAIGD's user interface shall only display active features and /or functions consistent with this operational standard.
- J. The FAIGD shall have a "YOU ARE HERE" arrow showing the location of the FAIGD in the building. Additional FAIGDs shall have the same map orientation with only the "YOU ARE HERE" location change to match relative locations for the additional FAIGDs

- K. The FAIDG's software operating system shall be factory engineered by the fire alarm manufacturer. The FAIDG's software operating system software shall integrate emergency and non-emergency functionality seamlessly through one operator interface.
- L. The non-emergency functionality includes but not limited to weather maps, directories, event messaging, way finding etc.

2.5 FIRE ALARM ANNUNCIATOR (FAA)

- A. General Description: Modular, power-limited design with electronic modules, UL 864 listed.
- B. Alphanumeric Display and System Controls: Arranged for interface between human operator and the Fire Alarm System including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.
 - 1. Annunciator and Display: Liquid-crystal type, 80 characters, minimum.
 - 2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.
- C. FAA User Interface shall store system events in one of four event queues represented by alarm, supervisory, trouble or monitor. The alarm event shall have priority over the supervisory, trouble, and monitor event queues with the ability to alternate between queues with a single button depression. On the activation of a system event the following sequence shall occur:
 - 1. On Alarm: The FAA interface shall display the first alarm event with the ability to scroll to the subsequent alarm events via the Alarm Queue button. The FAA interface shall on alarm display the following:
 - a. The Alarm Queue Led flashes indicating an alarm status is present.
 - b. A custom message is displayed detailing location.
 - c. The display shall indicate the number of active alarms present on the system.
 - d. The Alarm event status shall be identified as an active or restored event.
 - e. Alarm event acknowledge sequence shall execute as follows:
 - 1) The Alarm Queue button will sequentially step the operator through the alarm events, acknowledging the event on each Alarm Queue button depression. On the completion of acknowledging all alarm events, the Alarm Queue Led illuminates steady.
 - 2) A secondary means to view the alarm events shall be available via the up and down arrows. The Alarm Queue button shall return the display to the last acknowledged event.
 - 3) The FACP shall be capable of reset, alarm silence, and trouble silence by the Operator free of the need for 100 percent operator acknowledgement of prior events.

2. On Supervisory: The FAA interface shall display the first supervisory event with the ability to scroll to the subsequent supervisory events via the Supervisory Queue button. The FAA interface shall on supervisory display the following:
 - a. The Supervisory Queue Led flashes indicating a Supervisory status is present.
 - b. A custom message is displayed detailing location.
 - c. The display shall indicate the number of active Supervisory(s) present on the system.
 - d. The Supervisory event status shall be identified as active or restored.
 - e. Supervisory event acknowledge sequence shall execute as follows:
 - 1) The Supervisory Queue button will sequentially step the operator through the supervisory events, acknowledging the event on each Supervisory Queue button depression. On the completion of acknowledging all supervisory events, the Supervisory Queue Led illuminates steady.
 - 2) A secondary means to view the supervisory events shall be available via the up and down arrows. The Supervisory Queue button shall return the display to the last acknowledged event.
 - 3) The FACP shall be capable of reset, alarm silence, and trouble silence by the Operator free of the need for 100 percent operator acknowledgement of prior events.
3. On Trouble: The FAA interface shall display the first Trouble event with the ability to scroll to the subsequent Trouble events via the Trouble Queue button. The FAA interface shall on Trouble display the following:
 - a. The Trouble Queue Led flashes indicating a Trouble status is present.
 - b. A custom message is displayed detailing location.
 - c. The display shall indicate the number of active Troubles present on the system.
 - d. The Trouble event status shall be identified as active or restored event.
 - e. Trouble event acknowledge sequence shall execute as follows:
 - 1) The Trouble Queue button will sequentially step the operator through the trouble events, acknowledging the event on each Trouble Queue button depression. On the completion of acknowledging all trouble events, the Trouble Queue Led illuminates steady.
 - 2) A secondary means to view the trouble events shall be available via the up and down arrows. The Trouble Queue button shall return the display to the last acknowledged event.
 - 3) The FACP shall be capable of reset, alarm silence, and trouble silence by the Operator free of the need for 100 percent operator acknowledgement of prior events.
4. On Monitor: The FAA interface shall display the first Monitor event with the ability to scroll to the subsequent Monitor events via the Monitor Queue button. The FAA interface shall on Monitor display the following:
 - a. The Monitor Queue Led flashes indicating a monitor status is present.
 - b. A custom message is displayed detailing location.

- c. The display shall indicate the number of active Monitors present on the system
- d. The Monitor event status shall be identified as active or restored event.
- e. Trouble event acknowledge sequence shall execute as follows:
 - 1) The Trouble Queue button will sequentially step the operator through the trouble events, acknowledging the event on each Trouble Queue button depression. On the completion of acknowledging all trouble events, the Trouble Queue Led illuminates steady.
 - 2) A secondary means to view the trouble events shall be available via the up and down arrows. The Trouble Queue button shall return the display to the last acknowledged event.
 - 3) The FACP shall be capable of reset, alarm silence, and trouble silence by the Operator free of the need for 100 percent operator acknowledgement of prior events.

2.6 FIRE ALARM STATIONS

- A. Manufacturers:
 - 1. National Time and Signal Corporation, 541S.
- B. Provide manufacturer recommended back box to accommodate pull stations and addressable modules.
- C. Description: UL 38 listed; finished in red with molded, raised-letter operating instructions in contrasting color. Station shall show visible indication of operation. Mounted on recessed outlet box; if indicated as surface mounted, provide manufacturer's surface back box.
 - 1. Single-action mechanism with integral addressable module, arranged to communicate manual-station status (normal, alarm, or trouble) to the FACP.
 - 2. Station Reset: Key or wrench operated switch.
- D. Pull stations shall be mounted at 48" above finished floor.

2.7 SYSTEM SMOKE DETECTORS

- A. Manufacturers:
 - 1. National Time and Signal Corporation, D900-PHOTO.
- B. General Description:
 - 1. Operation of smoke detector heads shall sound evacuation alarm through all speakers and open contacts in duct detector for fan shut down circuits. Alarm and trouble condition shall also be indicated in annunciator panel. Each detector shall have a light to indicate activation and shall hold the signal of fire or smoke until manually reset.

2. Detectors shall lock in on alarm and shall have local or remote test and alarm/trouble capability.
3. Smoke detectors shall be analog-addressable with digital transmission of sensor values.
4. End of line power supervision module shall be compatible with the detectors.
5. UL 268 listed, operating at 24-V dc, nominal.
6. Smoke detectors shall communicate detector status (normal, alarm, or trouble) to the FACP.
7. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. Provide terminals in the fixed base for connection of building wiring.
8. Integral Visual-Indicating Light: Smoke detectors shall indicate detector status. When indicating light is not visible from the floor, a remote indicating light located in the ceiling or wall shall be installed.
9. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.
 - a. Rate-of-rise temperature characteristic shall be selectable at the FACP for 15 or 20 deg F (8 or 11 deg C) per minute.
 - b. Fixed-temperature sensing shall be independent of rate-of-rise sensing and shall be settable at the FACP to operate at 135 or 155 deg F (57 or 68 deg C).
 - c. Provide multiple levels of detection sensitivity for each sensor.
10. Provide integral sounder base for smoke detector indicated when cross zoned.
11. Provide integral sounder base for smoke detectors located in student rooms in residence halls.

C. Photoelectric Smoke Detectors:

1. Sensor: LED or infrared light source with matching silicon-cell receiver.
2. Detector Sensitivity: Between 2.5 and 3.5 percent/foot (0.008 and 0.011 percent/mm) smoke obscuration when tested according to UL 268A.
3. Analog type with digital transmission of sensor values.

D. Duct Smoke Detectors:

1. Manufacturers:
 - a. National Time and Signal Corporation, D900-DD-PHOTO.

2. Photoelectric Smoke Detectors:
 - a. Sensor: LED or infrared light source with matching silicon-cell receiver.
 - b. Detector Sensitivity: Between 2.5 and 3.5 percent/foot (0.008 and 0.011 percent/mm) smoke obscuration when tested according to UL 268A.
3. UL 268A listed, operating at 24-V dc, nominal.
4. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
5. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. The fixed base shall be designed for mounting directly to the air duct. Provide terminals in the fixed base for connection to building wiring.
6. Integral Visual-Indicating Light: LED type. Indicating detector has operated and power-on status.
7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.
8. Each sensor shall have multiple levels of detection sensitivity.
9. Sampling Tubes: Design and dimensions as recommended by manufacturer for the specific duct size, air velocity, and installation conditions where applied.
10. Relay Fan Shutdown: Provide one (1) set of contacts rated to interrupt fan motor-control circuit.
11. Duct smoke detectors shall include an addressable control module for fan shut-down and/or smoke/fire damper operation.
12. Duct smoke detectors shall include LED output terminals for connection to the associated Bullet Annunciator.
13. Duct smoke detector Bullet Annunciators shall operate independent of the duct smoke detector and shall not rely on the duct smoke detector for power or contract closures.

2.8 DUCT DETECTOR BULLET ANNUNCIATOR

- A. Manufacturers:
 1. National Time and Signal Corporation, D900 RA.
- B. Furnish an addressable microprocessor based remote bullet annunciator panel complete with LED annunciation and switch control, capable of flush or surface mounting.

- C. Provide Corbin catalog no. 15751 camlock, no. TEU-1 key.
- D. The remote bullet annunciator shall indicate detector status.
- E. General: UL 521 listed.

2.9 HEAT DETECTOR, COMBINATION TYPE

- A. Actuated by either a fixed temperature of 135 rate-of-rise of temperature that exceeds 15 deg F per minute, unless otherwise indicated.
 - 1. Mounting: Plug-in base, interchangeable with smoke-detector bases.
 - 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
 - 3. Integral Visual-Indicating Light: Smoke detectors shall indicate detector status.

2.10 NOTIFICATION APPLIANCES

- A. Manufacturers:
 - 1. National Time and Signal Corporation, SG-CX Series Speaker Strobes and SG Series Strobes.
- B. Description: Equipped for mounting as indicated and with screw terminals for system connections.
 - 1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly.
 - 2. Color: Provide red for all wall mounted devices and white for all ceiling mounted devices.
- C. Visible Alarm Devices: Xenon strobe lights listed under UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.
 - 1. Rated Light Output: 15, 30, 75, 110 candela on the MC Series or 135/185 on the HMC Series as required to meet NFPA 72 requirements.
 - 2. Strobe Leads: Factory connected to screw terminals.
 - 3. Strobe Lights shall be synchronized so that all strobes flash simultaneously.
- D. Voice/Tone Speakers:
 - 1. UL 1480 listed.

2. Speakers shall be connected for 70 volt amplifier output.
3. Low-Range Units: Rated 1 to 2 W.
 - a. Tap all speakers at 1 watt and 2 watts in mechanical rooms, unless otherwise indicated.
4. Mounting: Flush, semi-recessed, or surface mounted; bidirectional as indicated.
5. Matching Transformers: Tap range matched to the acoustical environment of the speaker location.

2.11 INTELLIGENT NOTIFICATION APPLIANCE CONTROL (NACP) PANELS

- A. NACP panels shall applied and located as approved by the Owner and Engineer.
- B. Furnish separately mounted addressable remote intelligent Notification Appliance Control Panels (NACP) complete with battery standby.
- C. Manufacturer's:
 1. National Time and Signal Corporation, D900-RPS-SG Series
- D. NACP panels shall connect to the *DigiComm*TM signaling line circuit and automatically report and display the following system fault conditions at the FACP, FFCP, and the remote annunciators. Each NAC circuit fault shall be required to identify the location of the circuit by way of a unique 40-character message. In addition, the NACP panel shall identify the location of the NACP panel by way of a 40-character message. The NACP shall be capable of annunciating the following trouble conditions:
 1. Processor Failure
 2. AC Power Failure
 3. Battery Fault
 4. Ground Fault
 5. Open Circuit for each NACP circuit
 6. Short Circuit for each NACP circuit
 7. Over current for each NACP circuit,
 8. Communication Fault
- E. Notification Appliance Circuit (NAC)
 1. Each NAC shall be capable of delivering 2.5 amps at 24 Vdc nominal.

2. Each NAC shall be capable of class A or B / style Y or Z operation.

F. Auxiliary Power Supply

1. Each NACP panel shall be capable of delivering 0.5 amps at 24 Vdc nominal.

G. Each NACP control panel shall have internal LED status indicators for individual fault conditions.

H. Fire Alarm manufacturers not meeting the Intelligent NACP requirements shall be required to provide notification appliance circuits directly from a FARCP panel in lieu of an Intelligent NACP.

2.12 ADDRESSABLE CONTROL MODULE

A. Provide for integration of auxiliary control functions into the analog signaling circuit. Intelligent analog signaling circuit control module shall have the following capabilities:

1. Communication interaction with the analog signaling circuit having the capability of initiating a control function to an auxiliary device based on a specified event.
2. Provide NO/NC contact pairs rated at 4 amp 120 VAC or 24 VDC for fan shut down and smoke damper closure.

2.13 WIRE AND CABLE

A. Wire and cable for fire alarm systems shall be UL listed and labeled as complying with NFPA 70, Article 760.

1. All fire alarm cabling regardless of use must be stranded and installed in conduit.
2. Shielded cable is only permitted for use from main FACP to remote FARCP and FAA. The shield on shielded cable shall be continuous throughout the circuit and insulated from ground and any other shielded cable except for the connection point at the panel.
3. Shield cable shall also be used for the microphone circuit.
4. Field devices shall be wired with non-shielded cable.

B. Initiating Device or Signaling Line Circuits and Annunciator Communication Circuit

1. Point addressable wiring shall be one pair of minimum #16 AWG THHN twisted pair stranded copper cable. Size of conductors shall be as recommended by manufacturer unless indicated otherwise on the drawings. If there is a conflict in conductor size, the larger conductor shall be installed if called for on the drawings or required by the manufacturer.

2. Each initiating device circuit shall have a separate circuit number and labeled at every point the circuit is accessible.

C. Notification Appliance Circuit

1. Notification appliance circuits shall be one pair of minimum #14 AWG THHN twisted pair stranded copper cable. Size of conductors shall be as recommended by manufacturer unless indicated otherwise on the drawings. If there is a conflict in conductor size, the larger conductor shall be installed if called for on the drawings or required by the manufacturer.
2. Notification appliance circuits shall be wired with different color, colors not already used in the fire alarm system, or circuits shall be numbered with wire markers on each end of each wire at every termination and joint. Wire markers shall be related to the fire alarm circuit or module connector numbers in the fire alarm control panel.
3. Annunciator communication wiring shall be one pair of minimum size #18 AWG shielded twisted pair cable.

- D. Provide two minimum #14 AWG THHN stranded copper wire to devices requiring power such as door magnets and annunciator panel power. Circuits shall be numbered with wire markers on each end of each wire at every termination and joint. Wire markers shall be related to the fire alarm circuit or module connector numbers in the fire alarm control panel. Larger conductor sizes shall be used if required to serve the load.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Smoke or Heat Detector Spacing:

1. Smooth ceiling spacing shall not exceed the rating of the detector.
2. Spacing of heat detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas, shall be determined according to Appendix A in NFPA 72.
3. Spacing of heat detectors shall be determined based on guidelines and recommendations in NFPA 72.

B. HVAC: Locate detectors not closer than 3 feet from air-supply diffuser or return-air opening.

C. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of the duct.

D. Audible Alarm-Indicating Devices: Install per NFPA 72 and manufacturers recommendations.

E. Visible Alarm-Indicating Devices: Install per NFPA 72 and manufacturers recommendations.

- F. FACP, FARCP and FAIGD: Surface or flush mount as indicated with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.
 - 1. Install smoke detector above all fire alarm panels and remote panels.
- G. If NACP panels are approved by engineer and MSU, they must all be mounted in an organized and accessible location(s).
- H. Any fire alarm device utilizing LED's for visual identification must be mounted so they can be viewed and read from the floor. If mounting cannot be viewed from the floor provide a remote indication device.
- I. Provide an intelligent fire alarm control panel FARCP on each building floor for distributed operation. Each floor's intelligent fire alarm control panel shall provide:
 - 1. Dedicated signaling line circuits originating from the floor's FARCP.
 - 2. Dedicated notification appliance circuits originating from the floor's FARCP and/or intelligent NACP.
 - 3. Alphanumeric Display and System Controls. System controls including but not limited to reset, alarm silence, and trouble silence.
- J. The use of an un-intelligent breakout enclosures housing circuits originating from other floors in lieu of an intelligent fire alarm control panel does not meet the requirement of this specification.

3.2 WIRING INSTALLATION

- A. Install wiring according to the following:
 - 1. NECA 1.
 - 2. TIA/EIA 568-A.
- B. Wiring Method: Install wiring in metal raceway according to Division 16 Section "Raceways and Boxes".
 - 1. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.
 - 2. Install red fire alarm conduit in all concealed locations including above accessible ceilings, and exposed areas such as mechanical rooms, electrical, and loading docks.
 - 3. Install all fire alarm wiring/circuits entering or exiting junction/pull boxes with a minimum of six inches of slack at each end.
- C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, tie wrap, and train conductors to terminal points with no excess.

Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

- D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.
- E. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

3.3 IDENTIFICATION

- A. All wiring shall be labeled where accessible in panels, at devices, junction boxes, pull boxes, etc. All smoke and heat detectors shall be permanently labeled with their respective address typewritten on the outside of the unit base. Marking shall be done with gummed paper tags installed on the surfaces that have been steel wool cleaned and typewritten addresses.
 - 1. Label all notification devices and visible alarm indicating devices with P-touch labeler. Identify circuit number, device number, and end of line.
 - 2. Provide a minimum of ¼ inch high text for all labeling requirements, unless otherwise indicated.
- B. Install instructions frame in a location visible from the FACP.
- C. Paint all fire alarm junction box covers red.

3.4 GROUNDING

- A. Ground the FACP and associated circuits; comply with IEEE 1100. Install a minimum No. 10 AWG insulated ground wire from main service ground to all FACP.

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
 - 1. Before requesting final approval of the installation, submit a written statement using the form for Record of Completion shown in NFPA 72.

2. Perform each electrical test and visual and mechanical inspection listed in NFPA 72. Certify compliance with test parameters. All tests shall be conducted under the direct supervision of a NICET technician certified under the Fire Alarm Systems program at Level III.
 - a. Include the existing system in tests and inspections.
3. Visual Inspection: Conduct a visual inspection before any testing. Use as-built drawings and system documentation for the inspection. Identify improperly located, damaged, or nonfunctional equipment, and correct before beginning tests.
4. Testing: Follow procedure and record results complying with requirements in NFPA 72.
5. Test and Inspection Records: Prepare according to NFPA 72, including demonstration of sequences of operation by using the matrix-style form in Appendix A in NFPA 70.

3.6 SYSTEM COMPLIANCE

- A. Manufacturer to provide one year of *On-Point*TM System Compliance connection to include:
 1. Reporting of fire alarm events via text and/or email messaging.
 2. Remote event viewing of active and historical events via secure browser interface.
 3. Remote factory diagnostic support.

3.7 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project outside normal occupancy hours for this purpose.

3.8 DEMONSTRATION

- A. Training
 1. Provide a minimum of 16 hours of factory service engineer training on the operation of the manufacturer's fire alarm system in general and on the system installed.

END OF SECTION 283100